Representative of Every Interest

The Citrus Industry

Representing No Special Interest

Citrus Insect Control For November, 1958

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BRIGHT PROSPECTS

The opening of a new season in the citrus industry holds promise of much that is very good for most Florida citrus growers and processors.

The effect of the severe freezes we had last winter is still in evidence in some places, but as a whole the citrus groves have made a phenomenal recovery from the ravages of last season's cold.

The results this year is that our crop is considerably shorter than last, with consequent higher prices . . . which, of course, means greater profits for those growers whose damage was slight.

On the basis of past history it would seem unlikely that the citrus industry will suffer any similar experience this season . . . if the weather remains reasonably normal this should be a banner season — pricewise — for Florida growers.

VOL. 39 — NO. 11 NOVEMBER, 1958 BARTOW, FLORIDA

W. L. Thompson

Citrus Insect Control

R. M. Pratt

For November 1958

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Florida Citrus Experiment Station, Lake Alfred

R. B. Johnson

Red scale infestations increased sharply in October and more than half the groves surveyed were infested. This is in marked contrast to the situation last spring, when this scale had survived the cold winter in only 14 percent of the groves checked. Activity will be high all through November and injury will be severe in many groves.

Purple scale infestations on leaves will be about average in November, but this year there seems to be more than the usual amount of scale on the fruit. Numerous reports of fruit drop due to scale around the button have been received and fruit is beginning to show green spots around live purple scale as color breaks.

Purple mite and Texas citrus mite infestations will increase during the month and will reach damaging levels in many groves.

Rust mite infestations will increase sharply on both leaves and fruit. The peak will probably not be reached before December.

Grasshoppers and plant bugs are causing damage in some groves.

SPRAY PROGRAM

This fall the recurrence of purple scale and the steady increase of red scale has made it necessary to apply a second scalicide in a high percentage of groves. Groves that have not had a fall scalicide should be carefully checked for purple scale around the stem-end of the fruit. Although leaves may be fairly free of scale, there may be enough scale around the stem-end of fruit, along with dry weather, to cause a heavy fruit drop. If scale is the cause of fruit drop, a November scalicide, thoroughly applied, will check the drop.

Red scale infestations can cause a heavy leaf drop with subsequent fruit drop and dead wood. It has been observed that where trees are heavily infested during the winter, the spring flush of growth is often sparse and the leaves small. It is advisable to apply control measures before a heavy infestation develops because red scale on fruit is a definite grade lowering factor for fresh fruit as well as for processing.

Scale Control: The thoroughness of application is as important as the scalicide. Thorough coverage is more difficult where mature fruit is on the trees than where the trees are free of fruit or where the fruit is comparatively small. Therefore, more attention should be paid to coverage than at any other time of the year.

Parathion, 15 percent (or its equivalent in other formulations) at 1.7 pounds or malathion 25 percent at 4 to 5 pounds per 100 gallons is recommended for a fall and winter scalicide. There should be 14 days between the application and harvest where parathion is used and 7 days for malathion.

Oil sprays are not recommended at this time of the year because of adverse effects on trees and fruit. Trees sprayed with any oil in the fall or winter are more susceptible to injury from freezing weather. Injury is most severe where both summer and fall applications of oil are made. Fall and winter oil sprays sometimes reduce the amount of bloom in the spring. Furthermore, late varieties of oranges or any variety that has not colored before the oil application will be difficult to degreen.

Purple Mite and Texas Citrus Mite Control: November is normally dry with periods of windy weather. These conditions are favorable for mesophyll collapse and "firing" of citrus twigs, and the injury will be more severe if purple mite or Texas citrus mite are present, even in small numbers. The best way to prevent leaf drop and subsequent dead twigs is to keep the mite population at a low level. This can be done by applying a miticide before 20 percent of the leaves are infested. In fact, the fewer mites present when the spray is applied, the longer the period of control. If mites are not found on the lower branches, the tops of some trees should be inspected because in cool weather mites are more abundant there than on lower areas.

There are a number of materials effective for spider mite control. These are described in decreasing order of effectiveness. Tedion has proven to be the most effective miticide in experimental work. However, no residue tolerance has been established for citrus and it should not be used on trees with fruit. It can be applied on trees without fruit and a limited amount is available for grower trial on bearing trees under an experimental sales permit. For best results, Tedion at ½ pound per 100 gallons should be applied before heavy infestations develop because it is slow to kill active mites. If Tedion is used where mites are numerous, it

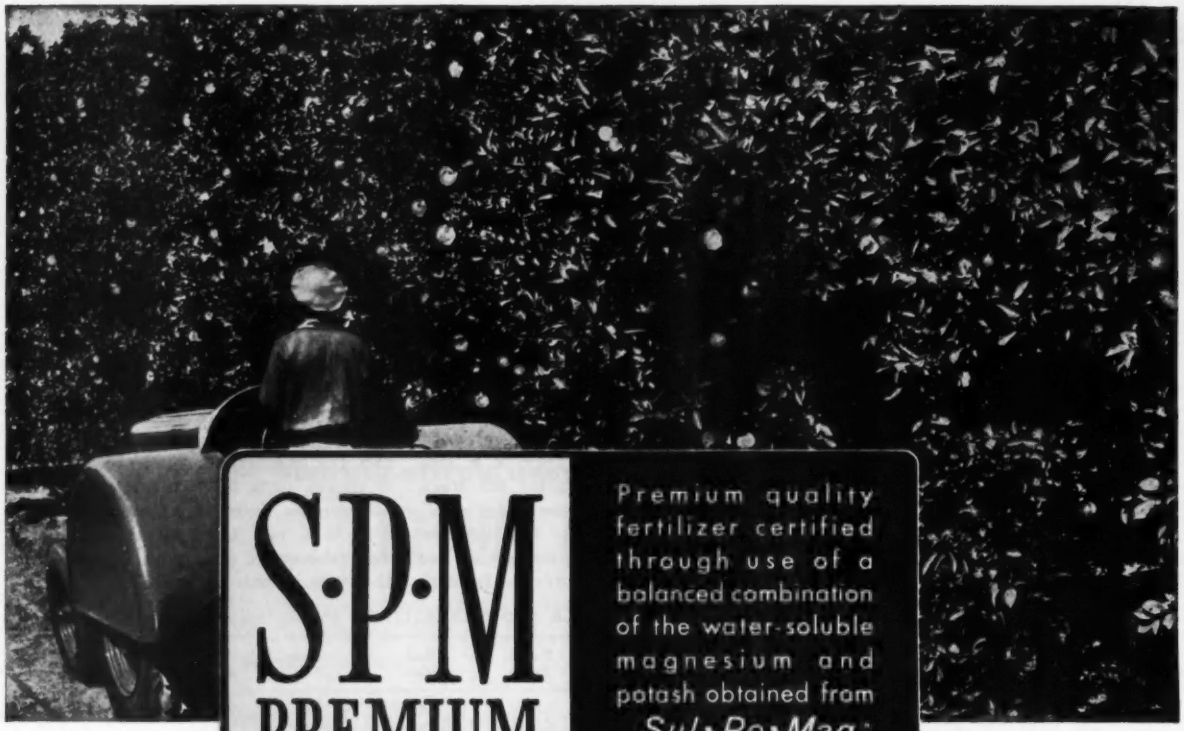
(Continued on page 5)

SCALE AND MITE ACTIVITY BY DISTRICTS *

District	Purple Scale	Red Scale	Purple Mite	Rust Mite on leaves	Rust Mite on fruit
West Coast	2.79	3.67	.67	2.00	2.30
Indian River	2.97	4.17	1.00	1.63	1.50
Upper East Coast	4.95	3.76	1.75	.87	2.00
Gainesville	3.83	.33	.67	1.17	1.00
Orlando	3.16	3.54	.39	.70	.82
Brooksville	3.36	.58	1.50	1.30	2.00
Ridge	4.13	4.30	1.19	1.70	1.90
Bartow	4.00	2.64	.63	1.81	1.54
State Average	3.56	3.70	.95	1.38	1.58
Last Year	3.67	3.22	.72	1.57	1.45

* Third week in October. Activity is computed from populations, amount of hatching of scales, and number of groves with increasing or decreasing infestations. Activity is considered high if above 4.0 for purple scale, 3.0 for red scale, and 1.5 for mites.

* Written October 23, 1958. Reports of surveys by Harold Holtsberg, Fort Pierce; J. W. Davis, Tavares; K. G. Townsend, Tampa; T. B. Hallam, Avon Park; and L. M. Sutton, Lake Alfred.



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INTERNATIONAL MINERALS & CHEMICAL CORPORATION

POTASH DIVISION . . . . . ADMINISTRATIVE CENTER — SKOKIE, ILLINOIS

Citrus Report...

. . . By . . .
FLORIDA CROP AND LIVESTOCK
REPORTING SERVICE
OCTOBER 10, 1958

* * * * *

FLORIDA

October Forecast: ORANGES 85,000,000 - GRAPEFRUIT 34,000,000 - TANGERINES 4,000,000.

Freeze damaged tree recovery has continued good duriing the summer and has been accompanied by extensive pruning and removal of dead trees. An active spray and fertilization program following the freeze has aided the condition of groves. During the latter part of September the cultivation of the generally thick cover crop was started, and fall fertilizer begun.

Since the heavy general rains of late spring and early summer, rainfall has been spotty, confined mostly to local showers. Temperatures have been above average, making it a hot, dry summer. September rainfall was below normal, causing groves in many areas to go into a slight wilt. Widespread use of irrigation was being made when heavy rains over practically all the citrus produciing area occurred October 3rd and 4th.

Last spring's bloom was about five weeks later than the previous season. Present maturity appears to be about three weeks behind last year, or about two weeks later than normal.

First shipment of grapefruit was made on September 26, compared with first movement last season at the end of August. A small movement of oranges was made in early October, with volume movement still two to three weeks away.

The October 1st forecast of production of **all oranges** in Florida is placed at 5,000,000 boxes, compared with a utilization of 82,500,000 boxes last season and the 1947-56 average of 75,700,000 boxes The **early and midseason** (including Temples) was set at 51,000,000 down 1.7 million from last year's 52,700,000 boxes, but still 9,950,000 boxes above the 1947-56 average. **Valencia** oranges were forecast at 34,000,000 boxes or 4,200,000 more than last year's use of 29,800,000 boxes, and compared with 32,950,000 boxes for the 1947-56 average. The forecasted 34,000,000 of **All grapefruit** was split 18,000,000 for **seedless** and 16,000,000 for other, this is about 10 percent more than last season's use of 31,100,000 boxes. A tangerine prospect crop of 4,000,000 boxes is nearly double last year's use of 2,100,000 boxes but is below the 1947-56 average. Temple oranges were forecast at 1,800,000 boxes and tangelos at 320,000 boxes.

CITRUS INSECT CONTROL FOR NOVEMBER, 1958

(Continued from page 3)

can be supplemented with parathion, TEPP, or Chlorobenzilate, materials that quickly kill the active mites. The addition of Chlorobenzilate will also control rust mites.

Trithion is effective at 1 pound of the wettable powder or ½ pint of the liquid per 100 gallons. It kills the active mites and has good residual properties as well as being about as effective as sulfur for rust mite control. The waiting period between an application of Trithion and harvest is 14 days.

Kelthane is effective at 1 to 1½ pints per 100 gallons. The period between an application and harvest is 7 days.

Systox at ½ to 1 pint per 100 gallons is effective and, like all other insecticides, should be used at the recommended dosage for best results. The period between application and harvest is 21 days.

DN Dry Mix No. 1 at 2/3 pound per 100 gallons is most effective when applied to low infestations where mite eggs are not abundant. However, the mixture of DN and parathion sometimes causes a leaf drop. Furthermore, where there is a breakdown of the peel of oranges, it increases the injury, especially where a drop of spray dries on the lower half of the fruit. Hamlins and pineapples are most susceptible to DN injury. For very light infestations a 1½% DN-sulfur dust is fairly effective for purple mite and rust mite control. No injury to fruit has been observed following a DN-sulfur dust. The period between a DN application and harvest is 12 days.

Rust Mite Control: Rust mite should be controlled throughout the winter because it can be a factor in causing leaf drop the same as purple mite and Texas citrus mite.

Zineb at ½ pound per 100 gallons or 3 pounds per 500 gallons is the most effective material for rust mite control. Zineb can be mixed with all materials used for purple mite and scale control. However, DN has not been as effective with Zineb as with sulfur.

Chlorobenzilate at ½ pound of the wettable powder or ½ pint of the liquid per 100 gallons is slightly more effective than wettable sulfur and can be mixed with materials used for mite and scale control. There is no waiting period between last application and harvest.

Wettable sulfur at 10 pounds per 100 gallons or 1 gallon of lime-sulfur plus 5 pounds of wettable sulfur are effective. Lime-sulfur should not be applied to tangerines and early varieties of oranges. A thorough sulfur dust application on a light infestation of rust mite is also effective, but not as effective as a spray.

Refer to the October issue of The Citrus Industry or the Florida Grower for details of the newer miticides.

Grasshopper and Plant Bug Control: Grasshoppers move to citrus after the cover crop has been worked in and may defoliate young trees. They also may migrate from adjacent areas into the grove. In any case both the trees and the cover crop should be sprayed.

Plant bugs are sometimes a pest in groves near old watermelon fields, where the citron melon is present, or where a leguminous cover crop was grown. The bugs suck the juice out of the fruit and punctured fruits drop.

Grasshoppers and plant bugs are controlled with the same insecticides. Parathion at 1.7 pounds per 100 gallons will kill the grasshoppers and plant bugs, but it has no residual effect. Materials with residual properties include Chlordane, toxaphene, lindane, aldrin, and dieldrin. Refer to the Spray Schedule or label on the package for the dosage to use.

Details of spray schedules and the various materials used will be found in the "Better Fruit Program" and this should be consulted to determine which materials may or may not be combined. For further information, consult the Citrus Experiment Station at Lake Alfred or Fort Pierce.

In home gardens, plants and refuse should be removed as soon as they have served their purpose. If they cannot be burned they should be buried. Removal of fallen rose leaves may reduce the amount of black spot next season.

Crop Estimates Will Have Little Bearing On Prices This Year

The 1958-59 season's first citrus crop estimate by the U. S. Department of Agriculture Oct. 10th should have little immediate bearing on the present on-tree price structure, Robert W. Rutledge, Florida Citrus Mutual general manager, said today.

"This is particularly true since Mutual's surveys show that from 75 to 80 percent of the 1958-59 orange crop already has ben committed by the growers," Rutledge said. "Thus, only a relatively small percentage of the crop remains for the open market."

"Just as important—and something Mutual has emphasized for years—the estimates will be just that, an estimate. Whatever prediction the USDA makes for the new crop will not represent absolute figures, but will be only a forecast of what the USDA believes to be the crop's size."

Rutledge said growers already have made marketing decisions on their own belief that this year's orange crop will run from 75,000,000 to 78,000,000 boxes.

"Whatever figure the USDA puts on this season's citrus crop, I don't believe there will be any serious arguments over this first estimate," Rutledge said. "It is a very difficult crop to estimate with any degree of certainly.

"Besides unusual conditions caused by last winter's freezes to add to the difficulties of making the forecast, we have had a rather spotty growing season. In some sections, particularly in Polk County, the weather has been the dryest in years. In other areas, there has been an abnormal amount of rain.

"Of course, one of the most important question marks concerning this year's crop is what to expect in the way of production from groves damaged by the freezes last winter. We have no experience to guide us in estimating what these groves eventually will produce."

Cottage cheese is a very desirable food not only for children but also for older people. It fits as well into the diet of one who is trying to lose weight as the one who is trying to gain.

The Citrus Industry
EXCLUSIVE SPECIALIZED CITRUS PUBLICATION
Issued Monthly
Representative of every interest
Representing no special interest

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Wind Machines For Frost Protection In Florida . . .

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Abstract

Investigations in several central Florida citrus nurseries during the past five years have shown that the wind machine provided some protection on the majority of cold nights. The degree of protection was dependent on three conditions; namely, the velocity of the natural wind, the nature of the vertical temperature profile, and the actual values of the temperatures composing the vertical profile. They provided most protection when (1) the wind was calm, (2) a good inversion existed, (3) air temperatures increased from below freezing at the surface to above freezing at twenty-eight feet. The effectiveness of the wind machines diminished rapidly as the natural wind velocity increased and when the temperatuce at the height of the machine fell below freezing.

The Federal-State Frost Warning Service, Lakeland, Florida has been investigating the use of wind machines for frost protection under Florida weather conditions for the past five years. Lake Garfield Nurseries Company of Bartow, was the cooperator during all the investigations to date. Their machines were located in nursery and small tree plots, and the effectiveness of the machines on the 18" temperature profile was our primary concern. A summary of these investigations is available upon request from the Federal-State Frost Warning Service, Box 1058, Lakeland, Florida.

PRESENTED AT
FLORIDA STATE HORTICULTURAL
SOCIETY MEETING

Florida's cold nights result from the transport of cold air (advection) into the state from more northern latitudes, the radiational cooling of cool, dry air already present, or a combination of the two. Advection may persist throughout the night when the wind is constantly transporting increasingly colder air into the state.

The night of December 11-12, 1957 is an excellent example of a freeze by advection. When dry, relatively cool air lays stagnant over the state radiational cooling alone may be sufficient to result in subfreezing temperatures and frost. If the wind diminishes in the wake of a cold air invasion, further cooling by radiation results. This combination of advection and radiation produces the greatest frequency of frosts and freezes in Florida.

Stratification Effect

The nature of the vertical temperature structure on the preponderance of cold Florida nights is such that there is an increase in temperature with height. These thermal inversions build as the earth cools at a faster rate than the air stratification above it. Each layer above the earth cools more slowly than the one beneath it. This is especially evident in the layers very near the surface where there is additional cooling of the air by contact with the colder earth.

Conduction, in addition to radiation, is contributing to the cooling process in these lowest layers while this method of heat transfer between adjacent stratifications rapidly becomes decreasingly significant with altitude. Hence the air at some arbitrary height within limits above the earth may often be considerably warmer than the air near the ground. Effectively breaking this inversion so that the warmer air above is thoroughly mixed with the colder air below is to add sensible heat to the lower layers as surely as heating them with fire. This is the basic function the wind machine was meant to perform.

Three Categories

How well does the wind machine perform this important function? The answer to this question depends on the existing meteorological conditions. More specifically it depends on the velocity of the natural wind and the vertical temperature profile. With respect to the wind, our investigations thus far can be broken down into three basic categories: namely, (1) constant velocities in excess of 6 MPH, (2) fluctuating velocities from 1 to 6 MPH, (3) calm winds with only brief intervals

(Continued on page 9)

Citrus Juice Served At International Fair In Germeny...

Eight to ten thousand Germans are being served Florida orange juice and California lemonade every day at the Fruit Exhibit of the U. S. Pavilion, International Exhibition of Groceries and High Class Provisions at Munich, Germany, it was disclosed today by Homer E. Hooks, general manager of the Florida Citrus Commission.

Hooks is attending the Exhibition, commonly referred to as IKOFA Food Fair, at the request of the U. S. Department of Agriculture. He is representing fruit industries of the United States at the big German extravaganza, which began on September 27 and closes October 5.

"This staggering total of servings — running to hundreds of gallons daily — is one of the most popular features at the Fair," Hooks said in a special communique today to Commission headquarters here. "For many Germans, this is their first taste of citrus, and they stand in long lines waiting to be served."

Hooks said a fountain outside the U. S. Fruit Exhibit simulates fresh juices cascading down a series of levels. Around the fountain are huge bowls of apples, years, plums, oranges, lemons and grapefruit.

Both fresh and canned fruits from all over the U. S. are shown on tiered revolving displays, giving the passing crowds a chance to see the tremendous varieties of fruits and juices which America exports. Eight large deep freeze boxes, he added, display frozen fruits and juices and other frozen products. Dried apples, dates, apricots, peaches, pears, prunes, raisins and nuts are shown in two huge glass cases and attract much interest.

Hooks said a new U. S. Department of Agriculture publication, "American Fruits for the Whole World," in color and in four languages, is given to importers and distributors of U. S. fruits who stop by the Exhibit. In addition to German importers, visitors from Sweden, Finland, Iraq and other countries have been noted.

No longer do perishable foods deteriorate as rapidly as formerly and now we can have practically any food we want at any season of the year.

WIND MACHINES FOR FROST PROTECTION IN FLORIDA

(Continued from page 7)

of light stirring. The efficiency of the wind machine under each basic category will now be discussed in the light of varying vertical temperature profiles.

With respect to number one condition, certainly no additional heat can be realized near the ground by operating a wind machine when there is no inversion: i.e. when the natural wind performs the mixing and there is actually a decrease in temperature with height. Indeed, it would be folly to operate a machine under such conditions and give the colder air above this added impetus.

However, this type of nocturnal vertical temperature structure is seemingly rare in Florida during the months when critical temperatures can occur. This statement may have to be qualified as the number of observations increase and of course certain height limits must be defined; but in all my observations to date I have yet to find a single instance where the temperature decreased as much as two degrees within the first 28 feet, the approximate height of the wind machines.

This includes the very severe black advection frost of December 11-12, 1957. That night—from all that we know now—is a classic example of when not to operate a wind machine. However, there are a lot of things we do not know now, and it is not entirely unlikely that future investigations may prove the wind machine of some value even on these nights of persistent cold advection.

For example, on this particular night the damage to small trees and nursery stock was greater in the areas that were fired only, than in the areas when fires were used in conjunction with wind machines. We have no proof that the machines were or were not responsible for the lesser damage in the areas where they were used with the fires, but we do know that the difference in an hour or two or a degree or two can often mean life or death to a leaf or fruit, bark splitting or no bark splitting.

Much more research and experimenting must be done before our recommendations for operating wind machines on nights of continuous, cold advection become valid. At present it seems almost useless to use them with wind velocities in excess of 6 MPH at grove level.

Second Phase More Favorable

The conditions of number two are more favorable for machine operation. When wind velocities persistently fluctuate in the range of 1-6 MPH, the temperature profile up to the height of the machine may be that of an inversion of varying magniture or it may be isothermal. Actually it will be changing with every rise and fall in the wind.

Experience has shown that wind machines provide some protection on the majority of nights of this type. The benefit here is not so much in actually raising the temperature near the ground, even though this is sometimes possible, but rather in retarding its rate of fall. As a consequence the absolute minimum is likely to be less than it would otherwise be, and the durations of the lower temperatures are reduced.

It is often extremely difficult to ascertain the value of the wind machine when category two exists. It is easy to become frustrated on such nights and make the mistake of turning the machines off and on as the natural wind increases and decreases. When in doubt the machines should be kept operating. There are two important reasons for this. Frist, temperatures often vary considerably between sheltered and unsheltered locations when the wind is less than 7 MPH.

Pockets may reach a critical temperature when the slopes and ridges within the same plot are well out of danger. Foliage and fruit on the windward side of a tree may be out of danger while that on the lee side is freezing, especially that which is exposed to the sky. The transport of heat by turbulence and eddy diffusion is obstructed when the wind is light.

It is not being evenly distributed around the tree or plant. Even a small plant may be an effective barrier under light wind conditions, but its resistance to the transport of air will diminish rapidly as the wind increases. Thus the added impetus of the wind machine often helps to keep the micro-climate of the field more uniform.

The second reason why the operator should keep his machines going when he is in doubt and the wind velocities are light and unsteady is probably more important than the first. Temperatures may fall rapidly during the lulls, much faster than they would if the machines were operating. Experience has shown that prematurely turning the wind mchine off when there is a light breeze and then turning it on during a lull is inefficient.

Degrees are lost in this way that can never be totally regained. During the periods when the machine is off unfavorable thermal stratifications are allowed to build that continuous operation of the machine would never have permitted. Thermal stratifications are functions of the wind velocity, and the shifting nature of these stratifications can be minimized by continuous operation of the machine.

Even on nights when it was difficult to allow much credit to the machines (solely on the basis of the temperatures in the area as compared with those areas outside the influence of the machines) the condition of the trees and nursery stock was better in the machine areas in the wake of the freeze and/or frost. If we disregard the small differences in temperature or durations of sub-freezing temperatures sometimes experienced, and we certainly should not, we cannot overlook the added stirring caused by the machines.

In our experience this has often meant the difference between frost or no frost. This alone can be very important. It is difficult to conceive of a plant or fruit totally escaping some cellular damage during the thawing process if it is coated with frost even though the thawing process is controlled. On the other hand, a frostless fruit or leaf may be just as cold as one with frost and escape the damage of a similar thawing process.

In addition to the fact that the wind machine slows the thawing process, it may also hold the liquids in the cells in a super-cooled condition, delaying or preventing ice and thus lessening the damage to the cells. Much more research needs to be done to clear up the conjecture in this last statement.

Calm Nights

So far nothing has been said about the effectiveness of the wind machine on nights that are predominately calm. These are the nights when the machines provide the greatest protection, and fortunately most of the critical temperatures experienced in Florida occur on calm nights. It follows that the wind machine provides some protection on the majority of critical nights. This has been our experience in nurseries and small tree plots.

(Continued on page 14)

Factors Affecting Quality In Citrus Fruits

The study of seasonal changes in Florida citrus fruits has been one of our major projects for the past two decades. Particular emphasis has been placed on those physical and chemical measurements that determine maturity and quality in the fruits. These data have furnished basic information for the establishment of the State of Florida citrus fruit laws.

Data showing the analysis of the fruit at various stages of maturity have commercial value to the grower and also to operators of canneries and concentrate plants who desire to process the fruit at the stage of greatest juiciness and greatest food value. The information is also being used by other research workers in the study of citrus rootstocks and varietal characteristics, and in studies on food nutrition.

Detailed information has been published on the principal varieties of oranges, grapefruit, and tangelos, and of Temple oranges and Dancy tangerines. It is possible to draw certain broad generalizations on some of the important factors that influence quality, such as ascorbic acid, juiciness, total solids, and flavor and palatability.

Ascorbic Acid

In view of the importance of the vitamin content of citrus fruits in determining their dietetic value, the ascorbic acid content is of particular interest.

Exposure to sunlight has an important influence on the vitamin content of oranges. Fruits grown on the outside of the tree and exposed to sunshine contain from 14 to 48 percent more ascorbic acid than those grown on the shaded inside branches. From outside to inside fruits, the concentration of ascorbic acid, when calculated as milligrams per milliliter of juice, gradually becomes less. The concentration of ascorbic acid in citrus juices decreases as the fruit matures but the total content per fruit remains about the same, the vitamin being dispersed in the increased amount of juice found in the more mature fruit.

As the fruit becomes over-mature and begins to dry out, its ascorbic acid content diminishes. The ascorbic acid concentration is higher in oranges and grapefruit than in tangerines and tangelos. The range, depending on kind and variety of fruit, is from about 0.22 to 0.55 milligrams per milliliter of juice. Important factors other than kind and variety are: size of the fruit, degree of ripeness, rootstock, crop year, and as already pointed out, the exposure to sunlight, which depends on position of fruit on the tree.

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Juiciness

Considerable study has been devoted to the correlation of juiciness with the stage of maturation in citrus fruits. When oranges and grapefruit are immature, the rind and flesh have a greenish color; the juice vesicles appear like grains of rice since they are not distended with juice as in the mature fruit. The walls of these juice cells are thick and conspicuous; the juice itself is greenish-yellow, lacks aroma, is acid to very tart, and has a raw, slightly bitter, immature taste. As the fruit matures, the greenish color in the rind disappears and, in oranges, the fruit takes on its characteristic aroma and orange color, or, in the case of grapefruit, a tannish-yellow color.

Progressive changes also occur within the fruit; the vesicle cell walls become thinner and the vesicles larger. The greatest rate of increase in the size and weight is during the last few weeks before maturity. The volume of juice increases until the fruit reaches prime eating condition. Here it remains rather constant and ranges between 45 and 60 percent. Late in the season the fruit starts to dry out. When this happens, the volume of juice decreases and the flavor dederiorates. Temples and tangelos contain the highest percent juice and grapefruit the lowest. Oranges and tangerines are intermediate.

Total Solids

The greatest amount of sugar is found in fruits that are left on the trees until they reach optimum maturity. Conversely, fruits picked before they have become mature neither contain their potential maximum of sugars nor do they develop any more sugars after picking. While sugars increase, acidity decreases as the fruits become more mature, and the most desirable eating quality is reached when there is such a balanced blending between the total solids (principally sugars) and the total acid (citric) as to make the fruit most palatable.

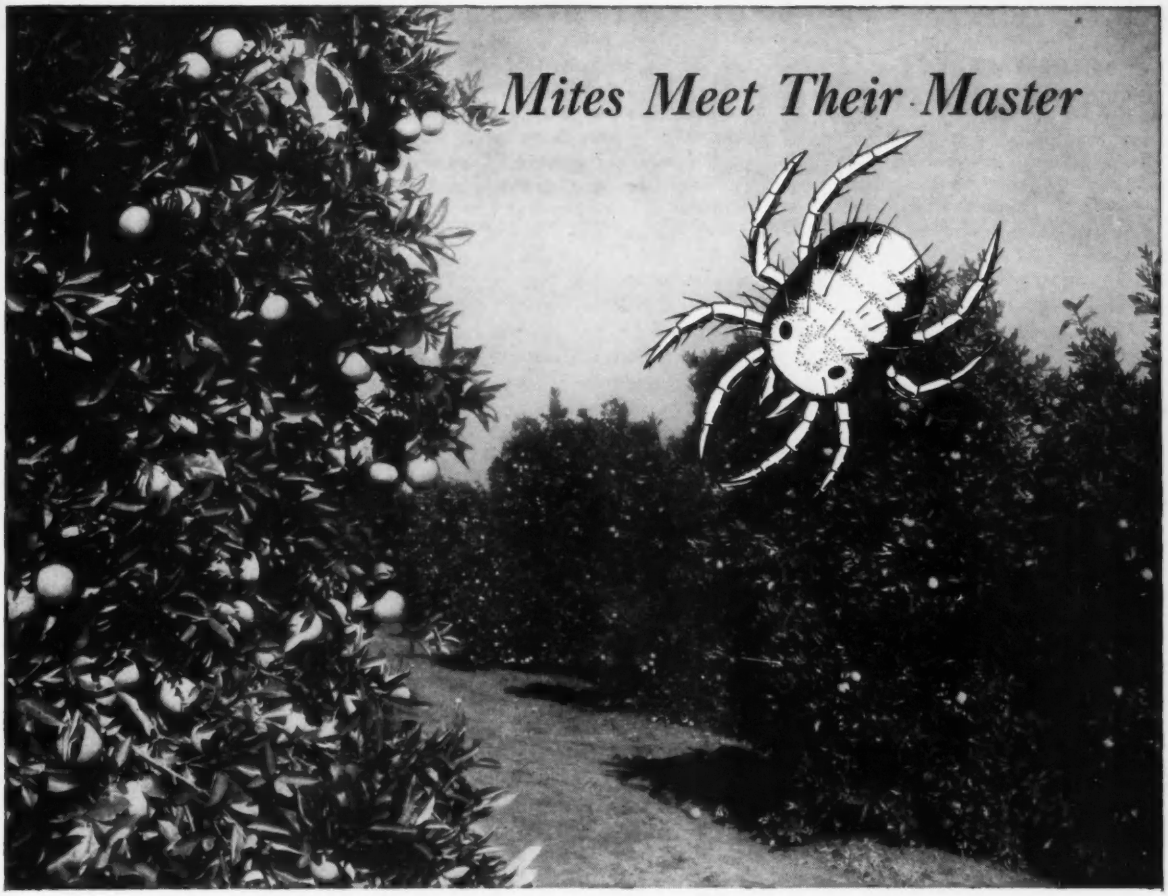
Because most consumers probably consider sweetness the most esential character in oranges, the desired condition of balanced blending may be said to occur, for all practical purposes, when the fruit contains its maximum potential sugar content. The total solids generally increase during the early stages of maturation of the fruit. The rate of increase depends on the kind and variety of citrus, but was found to be rather uniform throughout the commercial shipping season. There is a tendency for the total solids content to remain constant in ripe grapefruit and very ripe tangerines.

An interesting observation is the comparatively small range of 9 to 14 percent total solids in prime citrus fruits. Valencias, seedling oranges, Temple oranges, and tangerines average higher in total solids content than Hamlin oranges and Thornton tangelos.

Flavor and Palatability

The importance of the various

(Continued on page 12)



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FACTORS AFFECTING QUALITY IN CITRUS FRUITS

(Continued from page 10)

physical characteristics such as weight, color, and texture of rind that may affect the appearance and commercial grade of the fruit should not be minimized, but inherently it is the composition of the fruit and not color of the rind or the appearance that determines palatability and nutritional values.

The maintenance of high nutritive values in fruits is of great importance, for the health of the nation depends on an adequate supply of vitamins, carbohydrates, fats, proteins, and minerals. Citrus fruits, to have real consumer acceptance, must taste good, look good, and have high nutritive value. It is essential that the fruit be mature and have good flavor. The flavor of immature fruit is unacceptable, whereas mature citrus fruit has attained such a stage of development that it has good eating quality.

There are, of course, no hard and fast lines of demarcation between successive stages through which fruit passes from the time it is first formed until it completes its growth and development. As fruit matures, it becomes more and more pleasant to the taste, until it reaches perfection for any variety. Thus, quality in citrus appears to be related to physical development and to the proper blending of the various chemical constituents. Some of these, such as the bitter principles and aromatic compounds, are present in very small amounts but they are very important since they apparently supply spiciness and bouquet which characterize certain varieties.

In our studies the eating quality of fruit was given special attention. A panel of taste testers consisting of about 40 individuals appraised and scored each lot of fruit. Scoring of all samples was done according to an arbitrary standard scale. Our general findings show that Temple oranges, Valencias, and Florida seedlings have slightly higher flavor and more taste appeal than some of the other varieties. Tangerines, grapefruit, and tangelos also rate high flavor. Of the tangelos, the Orlando and Minneola rate slightly above the Seminole and Thornton varieties. However, each kind and variety of citrus fruit has its proponents, so no broad generalization can be made as to preference.

Summary

During the past twenty years comprehensive studies have been made on the seasonal changes in physical characteristics and chemical constituents of oranges, grapefruit, tangerines, Temple oranges, and tangelos by the Quality Maintenance and Improvement Section, U. S. Department of Agriculture, Orlando, Florida.

The findings show that citrus fruits contain high concentrations of ascorbic acid, ranging from 0.22 to 0.55 milligrams per milliliter of juice. Two important factors influencing the concentration of this vitamin are variety and exposure of the fruit to sunlight. Juiciness is associated with prime eating condition. The amount of juices ranges between 45 and 60 percent of the fruit at this stage. The total solids content is highest in ripe and overripe fruits and ranges beween 9 and 14 percent. Flavor and palatability are related to many substances but are most readily associated with the sugars and acids and the aromatic compounds.

Bibliography

HARDING, Paul L.
1943-1947. Citrus at Its Best. Yearbook of Agriculture, U. S. Department of Agriculture. pp. 858-862.

..... and Fisher, D. F.
1945. Seasonal Changes in Florida Grapefruit. U. S. Dept. Agr. Tech. Bul. 886, 100 p., illus.

..... and Sunday, M. B.
1949. Seasonal Changes in Florida Tangerines. U. S. Dep. Agr. Tech. Bul. 988, 59 p., illus.

..... and Sunday, M. B.
1953. Seasonal Changes in Florida Temple Oranges. U. S. Dept. Agr. Tech. Bul. 1072, 61 p., illus.

..... Seasonal Changes in Florida Tangelos. (Manuscript in preparation).

LONG, William G., Harding, Paul L., and Soule, Mortimer, J., Jr.
1957. The Ascorbic Acid Concentrations of Grapefruit of Different Sizes Fla. State Hort. Soc. Proc. (1957) pp. 17-21 .

USDA SEEKS WAY TO CALCULATE VOLUME OF CONCENTRATE FRESH CITRUS WILL YIELD . . .

Since the practice of buying fruit for frozen concentrates on the basis of juice and solids content has become prevalent, accurate methods to calculate the quantity of concentrate which can be produced from fruit of a given solids content is a matter of great interest to growers and processors. W. Clifford Scott and Donald A. Morgan, of the U. S. Fruit and Vegetable Produce Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Winter Haven, Fla., have been working on this problem for two years.

During the past year, they conducted studies of materials balances, both in the laboratory and in a commercial orange concentrate evaporator. They report that titratable acidity, pycnometer Brix, refrectometer Brix total solids, or soluble solids obtained by vacuum drying are reasonably reliable bases for calculating materials balances, that is, the output which can be expected from a given input of single-strength juice.

WIND MACHINES FOR FROST PROTECTION IN FLORIDA

(Continued from page 9)

It would not be presumptuous to expect as much in any field of short truck crops. However, the mature citrus grove poses a more complex problem and it is most important that we extend our research into this area. The greater the inversion the greater will be the rise in temperature where the machine is made operative. The temperature rise will take place in a very short time, usually in two or three revolutions of the fan.

It is seldom that the machine will raise the shelter temperature to that at the height of the fan, but on most occasions it will come within a degree or two of accomplishing this. Then as the night progresses and it continues to get colder, there will be a slow decline in the temperature at shelter height which closely resembles the rate of fall at fan height.

The rise in temperature caused by the wind machine on calm nights will not only be a function of the magnitude of the inversion but will also depend on the specific temperatures of the inversion. On exceptionally cold nights (temperatures in the low 20's) the inversion is usually small.

One of the reasons for this is the fact that the rate of cooling of the earth's surface becomes much slower once it reaches the freezing point, expecially if frost forms. Hence the difference in the rate of cooling of the earth and that of the air stratifications above it is not as great as it was prior to reaching the freezing point. The subsequent inversion is therefore smaller.

On very cold nights the temperature at the height of the machine may be lower than freezing while it is only a few degrees colder at the surface. While the machine will provide some protection on a night like this, it is usually not ample, and some firing becomes necessary.

Another factor affecting the efficiency of the wind machine seems to come into prominence when the air is very cold or very dry. If it very cold it is usually very dry so both can be considered at once. The density of air is affected by changes in its water vapor content and its temperature. Cold air is more dense than warm air; dry air might, by virture of its density, be more resistant to displacement by the machines, thus rendering the machines less effective.

The most favorable vertical temperature structure for machine operation seems to be when the temperature at the height of the machine is above freezing while the temperature near the ground is in the middel twenties. The machine will blow the hat off your head at 300 feet under these conditions, but velocities diminish considerably as the temperature at the height of the machine falls below freezing.

Except for the studies made during the 1957-58 season our investigations have been very limited, and all have lacked the desired degree of thoroughness. Manpower and equipment shortages imposed and continue to impose, severe restrictions on our efforts to the point of making them feeble when viewed in the light of the importance the wind machine may have in the Florida horticulture picture.

Much more work needs to be done, research should be expanded into the mature citrus groves and farming areas in all parts of the state embracing all the various terrains characteristic of the state. At best this would be a slow process due to the restrictions imposed by the warm seasons on assembling pertinent data, but we should not add to the delay by only extending a token effort to this promising project.

FFVA GROWERS ELECT OFFICERS & DIRECTORS

All officers and members of the Executive Committee of the Florida Fruit and Vegetable Association were re-elected at the annual membership meeting of the Association held during the 15th Annual Convention at Miami Beach. To serve during the coming year: Roy Vandegrift, Jr., Pahokee as president; Rudolph Mattson, Ft. Pierce as vice president; and Joffre C. David, Orlando as secretary-treasurer. David is also general manager of the Association.

Serving as members of the 5-man Executive Committee, re-elected, were in addition to Vandegrift and Mattson, Andrew Duda, Oviedo; Luther L. Chandler, Goulds, and J. P. Harllee, Jr., Palmetto.

CITRUS ESTIMATE - OCT. 1, 1958

(Released by U. S. Department of Agriculture Oct. 10, 1958)

COMPARISON OF OCT. 1, 1958 ESTIMATE WITH ACTUAL PRODUCTION FOR PRIOR YEARS

	ACTUAL PRODUCTION*		ESTIMATED FOR 1958-59
	1956-57	1957-58	(At Oct. 1)
ORANGES			
U. S., All	131,905	109,055	/1
Florida, All	93,000	82,500	85,000
Early & Midseason	51,600	49,200	49,200
Valencias	38,700	29,800	34,000
Temples	2,700	1,500	1,800
California, All	35,900	23,100	/1
Early & Midseason	15,400	9,100	12,000
Valencias	20,500	14,000	/1
Texas, All	1,600	2,000	2,300
Arizona, All	1,290	1,250	620
Louisiana, All	115	205	180
GRAPEFRUIT			
U. S., All	44,780	39,780	/1
Florida, All	37,400	31,100	34,000
Seedless	21,600	17,600	18,000
Other	15,800	13,500	16,000
California, All	2,400	2,400	800 /2
Texas, All	2,800	3,500	4,200
Arizona, All	2,180	2,780	2,000
TANGERINES			
Florida	4,800	2,100	4,000
Total U. S. Citrus /4	181,485	150,935	/3
Total Florida Citrus /4	135,200	115,700	123,000

* Thousand Boxes

/1 Estimate not available until Dec. /2 Desert Valley only.
/2 Total on Dec. 10 /4 Excluding Lemons & Limes.

The Discovery Of The Nutritive Value Of Trace Elements In Florida

. . . By . . .

DR. O. C. BRYAN*

Although observations from time to time had indicated noticeable plant responses from elements not commonly considered as nutrients, such responses had not been consistent nor significant enough to attract much attention until the middle twenties. The overall records pointed up the toxic and poisonous properties of trace elements more than their nutritive qualities.

Some technicians felt that some trace elements might have nutritive properties but their needs were questioned because of the minute quantities required by the plant. Furthermore, the content of trace elements in soils was assumed to be adequate, and no one had shown that trace elements would alleviate physiological diseases of plants and animals. Unusual and phenominal records seemed necessary to arouse much attention from technical workers.

This occurred somewhat accidentally with outstanding plant response to copper on the peat soils of the Florida Everglades in 1925 in connection with a special mission by the writer. (Fig. 1). Since copper was a known poison, its nutritive qualities were in doubt. Out of sheer curiosity, however, these responses stimulated much discussion and speculation.

Conclusions

The conclusions reached by most of Florida's technical workers were that these responses to copper were due either to fungicidal action on soil organisms or counteracting soil toxins. These conclusions seemed plausible and logical in view of the history of copper. Furthermore, peat soils could hardly be deficient in any nutrient to the extent of producing such marked responses, especially from such small amounts. At first much emphasis was placed on these assumptions, with little or no attention given to possible nutritive properties.

Following the marked responses in 1925 some growers in the Everglades area made soil applications of copper with favorable results. Their reports received wide publicity in 1926 and early 1927, thus focusing the problem to the attention of the experiment station officials to restudy the effects of copper and other trace elements on the plant abnormalities in the area. This began in the spring of 1927 and was given special priority.

Due to the urgency of the project, a preliminary report covering plant responses to a number of trace elements was prepared and published as Bulletin 190 by the Florida Experiment Station in September of 1927. These records confirmed the responses to copper and other elements in 1925. But they were a puzzle to almost everyone and stimulated a host of workers in Florida and elsewhere to restudy malnutrition problems in a broader manner than ever before.

Records of long standing were reviewed. McHargue's reports (9) dealing with the presence of copper, manganese and zinc in forage crops began to make sense, but the mere presence of an element in a plant did not prove its essentiality. Their presence had been known for many decades. A more direct approach was necessary to demonstrate the vital role of trace elements and bypass the fungicidal and soil toxin assumptions.

This was done by the writer (4) through the application of dilute solutions of copper and manganese to unhealthy plants growing on peat soils. The response of these external applications were very favorable, and chlorotic leaves became green, healthy and normal. Since the plants were free of pathogenic organisms, these records confirmed the essentiality of copper and manganese for normal plant growth. Before that time the absorption of plant nutrients through the leaves was not accepted by technical workers. To a degree the responses to external applications of trace elements pioneered the nutritional sprays commonly used today.

New Approach

This new approach to nutrition had its beginning in the late twenties, and it is doubtful that any decade in history has been more helpful in clarifying malnutrition problems and physiological diseases than the decade following 1925, as the following records will reveal.

Although iron was one of the essential plant nutrients announced long before the turn of the century, the specific need of iron in Florida was not established until 1930-31 when Becker and associates (3) experimentally showed that the age old salt sick problem of cattle was a deficiency of iron and copper. The records which lead to this discovery were suggested by the marked plant responses to copper in 1925.

Soon after these reports were published iron sprays were shown to be a corrective for chlorotic grasses on acid soils. (Press Bul. 450 Fla. Exp. Sta.). These records gave positive evidence that some Florida soils were deficient in iron and copper, particularly the lighter types. Iron was known to be deficient in alkaline soils, but this had never been pointed out for acid soils. Once attention was focused on deficiency symptoms of crops patterns, iron deficiency were soon recognized in many crops.

This new study of malnutrition grew rapidly, and deficiency symptom patterns were well illustrated before 1940. (Bul 93 Fla. State Dept. of Agr.). As a result of these findings, iron became widely used as a corrective for iron deficencies during the early 40's, either as a spray or soil application, and by

* Technical Director, Soil Science Foundation, Lakeland, Florida.

1950 the cumulation of copper was of such magnitude in some soils, to cause marked iron deficiency. This was somewhat alarming. But it was soon found that adequate lime and extra iron compounds (chelated iron in severe cases) corrected this problem.

Early Reports

Following the early reports dealing with manganese (1), (4), (13), this nutrient gained popular usage for truck crops on alkaline and marl soils in the early 30's. Furthermore, Skinner and associates demonstrated marked benefits to citrus on acid and neutral soils from application of manganese in 1934 (Fla. State Hort. Soc. Proc.), thus confirming a wide need for this trace element in Florida. (These and other records placed manganese on the list of essential nutrients for Florida agriculture by 1936).

The function of copper in plant growth was still a puzzle in 1930, in spite of its long use as a tonic for citrus stemming from Frotcher's reports around the turn of the century. (Fla. State Hort. Soc., 1897). Strange as it may appear, the toxic properties of copper prevailed over its nutrient properties. The marked and phenomenal responses of many physiologically ailing plants to soil and external application of copper were not sufficient evidence to accept it as an essential nutrient for citrus. It remained for Fudge (6) to prove its nutritive value for citrus in 1936, confirming the long practice of growers.

The use of zinc as a trace element grew rapidly following Chandler and associates' (5) findings in California in 1932, that zinc was a specific cure for the old problem known as "frenching" and little leaf of citrus. The next year Mowry (10) discovered that zinc was a specific cure for copper leaf of tung trees, and Barnette (2) showed that the physiology disease of corn known as "White Bud" was a zinc deficiency the following year. These and other records soon placed zinc in the list of essential trace elements.

Reports From South Africa

Although the toxic properties of boron, carried as impurities in potash fertilizer, were widely known in the 20's, Singleton (8) had observed enough records to indicate its possible nutritive value to citrus by 1929. And Haas of California (7) experimentally demonstrated in controlled cultures the essentiality of boron for citrus the same year. Furthermore, Morris reported that boron was a corrective for hard fruit in Rhodesia in 1935. (British S. Africa Co. Mazoe Citrus Sta. Ann. Report 1936).

But the nutritive properties of boron were not pinpointed in Florida until 1936-37 when Purvis and Ruprecht (11) demonstrated its essential need for celery. By this time, many crops over the country were showing favorable response to boron and it was not difficult for many Florida growers to accept Morris' record of boron as a corrective for hard fruit, including lumpy rind, as well as abnormal leaf conditions. The use of boron gained in spite of its history of toxicity and became widely used for Florida citrus during the 40's. Smith and Reuther's identification of boron deficiency symptoms in Florida orange groves in 1949 increased its use as a trace element.

Figure 1. The records associated with the above photograph are history making. They mark the turning point in the conception of the nutritive qualities of trace elements. It was unbelievable in 1925 when this photo was made, for copper — a known fungicide — to produce such outstanding plant responses on peat soils. But the records focused the attention of technical workers to revaluate and restudy the use of trace elements in coping with nutritional problems.

Note — Normal and healthy corn and cowpeas at upper right where copper sulphate was applied at rate of 150 lbs. per acre at planting, compared to complete failure of plants to grow where no copper was applied (foreground stakes). The lesser plant growth at upper left received powdered Bordeaux at planting similar to copper sulphate. The reason for using Bordeaux was suggested from its stimulating effects in connection with pest control measures.

Trace Elements

The nutritive concept of trace elements continued to grow. By the late 30's records from many sources had established the essentiality of boron, copper, manganese and zinc for plant growth, and confirmed the needs for iron for many Florida soils.

Strange as it may appear, these five trace elements were in the list of elements used in 1925 in an effort to correct the physiological plant diseases on the peat soils of the Florida Everglades. And the numerous research reports since that date have added only one trace element to the original list, namely, molybdenum for plants and one for animals, namely, cobalt.

Both of these have practical applications in Florida. The need for cobalt in animal nutrition was first suggested in Australia. Becker and Neal demonstrated its vital need to Florida animals in 1937 (3a) and Stewart and Leonard (14) in 1951 discovered that the mysterious "yellow spot" of citrus was a molybdenum deficiency.

Although magnesium is not a trace element, its use in Florida was limited in 1930. Strange as it may appear, the widespread problem of citrus bronze, a physiological disease, was not associated with the magnesium reported by Reed and Haas (12) in California in 1924. The bronze problem was rather acute in Florida in the late twenties and early thirties, and much study and effort by many workers were spent in search for a solution. This was finally shown to be a magnesium deficiency in 1935 by Bryan and DeBusk. (Florida Grower 45 (2) 1936).

Trace Elements Now Common

A rational use of the above named trace elements has revolutionized

(Continued on page 20)

Viruses--What They Are And How They Affect Citrus

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PRESENTED AT CAMP McQUARRIE CITRUS INSTITUTE

For practical purposes a virus may be regarded as an exceedingly minute obligate parasitic organism, which grows and multiplies only within and at the expense of living hosts. In many ways they resemble bacteria, but they are too small to be seen through ordinary light microscope.

They infect both animals and plants and are even important parasites of bacteria, approximately 150 viruses which affect animals are known, 65 of these affect man. Among the common virus diseases affecting man are smallpox, yellow fever, poliomyelitis, measles, mumps, influenza, common colds, warts, and cold sores; in animals, hog cholera, cattle foot and mouth disease, rabies, Newcastle's disease of chickens are important examples.

Some 400 more viruses affect plants. In plants, tobacco mosaic, aster yellows, spotted wilt, cucumber mosaic, and potato leaf roll provide classic examples. Virus diseases are so varied in their symptom expression that virtually any symptoms which can be described can be found on plants affected by one or another virus; this fact has lead some to postulate virus when the cause of a disease is not known. There is no commercially important crop plant that does not have one or more virus diseases which can affect it. Some crop plants such as tomatoes, peppers, potatoes, cucumbers, and beans are notorious for virus infections, and in some areas they are commonly universally infected by the end of the growing season.

Plants propagated vegetatively such as potatoes, chrysanthemums, gladioli, lilies, and fruit trees present a serious problem, since once they become infected, propagation from them will usually carry the virus infection to all the progeny. Some of our fruit plants are so universally infected that their production records and even their variety descriptions are based on diseased specimens.

ALL VIRUSES ARE PARASITES

Viruses, like bacteria, their closest relatives, vary in size and shape but are unlike bacteria in that as far as known all viruses are obligated parasites; that is, they cannot grow and multiply outside of their living hosts. Many bacteria are truly saprophytes, living their whole lives on dead or decaying matter. Most of the pathogenic bacteria which infect plants can grow and reproduce on dead plant materials.

Only a few of the viruses infecting plants can live very long outside their living hosts; tobacco mosaic virus has been recovered from dried tobacco leaves which had been stored 52 years but, on the other extreme, spotted wilt virus lives only a few hours in a test tube in juice expressed from diseased leaves. Viruses must be parasites because they cannot use the simple sugars and decomposition products of their hosts but must use the more complex acids and related compounds found only in living hosts. Plant viruses thrive best in plants that are rapidly growing when they are infected.

SIZE OF VIRUSES

In the size the largest viruses approach that of the smallest bacteria and smaller viruses range down the scale to only slightly larger than the largest molecules of their hosts. By actual measurements they range from 10 mu. (1/1,000,000 of a millimeter or 1/250,000,000 of an inch) up to 450 mu. Perhaps it would be more realistic to compare these small bodies to something tangible; 100,000 particles of a poliomyelitis virus laid side by side would equal a line long enough to reach across the head of an ordinary household pin.

SHAPE OF VIRUS

Viruses are equally as variable in shape as ther cousins the bacteria. Some are spheres, egg-shaped, tubular rods, hexagonal rods, cubes, biscuit-shaped, polyhderons, tadpole, etc. Some have smooth surfaces and others have papillate bumps. All the particles of each individual virus are similar in size and shape. These shapes have been carefully determined with the aid of the electron microscope, x-ray defraction, and other physical means of measurement.

Viruses also vary in their chemical make-up. This no doubt determines the range of host plants in which they can grow. In general they are composed of a central core of nucleic acid strands sheathed in a cylinder or jacket of protein.

HOW VIRUSES AFFECT PLANTS

Once inside a living host cell a single virus may multiply very rapidly, and the new particles may pass rapidly to other cells, and tuhs cause a systemic infection. Some viruses appear to have toxins which act as poisons and cause the host to turn yellow and die; some others cause only local areas to die; still others interfere with the development of normal green color and cause patterns of green and yellow—the mosaics. The range of symptoms includes witches'-brooms, stunting or excessively lush growth, galls, nutritional unbalance, as well as others.

Some viruses become well distributed throughout the living tissues of their hosts, but others appear to be limited to only portions. In general, plant viruses are thought to cause symptoms by interfering with the normal enzyme reactions of with growth-regulator systems necessary for normal metabolism. They may also rob the plant of some of its self-developed building blocks such as nucleoproteins.

HOW PLANT VIRUSES GET WHERE THEY ARE

Some apparently were present in native plants and spread to crop plants when the areas became cultivxated. Others have been brought into areas on nursery stocks such as trees, cuttings, bulbs, and tubers. Fortunately, few viruses go through seeds from the mother plant to the daughter. Once brought into an area a virus may find a vector, a natural carrier, which can move it from diseased to healthy plants.

Insects are the most common vectors. They acquire virus-bearing juice from the infected plants and leave a little of it when they feed after moving to healthy plants. Many plant viruses have no insect vectors or at least have none in the areas where they are commercially important. In such cases they have been inadvertently spread by man

in his quest for better sorts by bringing in infected trees, budwood, tubers, ect. In most cases such transport has been either in dormant material, in which case the presence of the virus was not evident, or in material from tolerant hosts, plants which express meager or no symptoms; hence the virus was an obscure hitchhiker.

VIRUSES AFFECTING CITRUS

Citrus was considered relatively free from virus diseases until recent times, but now has approximately 10 viruses to complicate its culture. The first citrus virus was recorded in 1933 when Dr. H. S. Fawcett, Dean of Citrus Pathology, showed that psorosis was transmissible and therefore caused by a virus. Subsequently, a succession of virus disease including stubborn, tristeza, exocortis, xyloporosis, vein enation, satsuma dwarf of Japan, infectious mottling, limequat vein banding, and others under various names have been resolved.

Psorosis is world-wide in distribution and has caused early decline and death of millions of trees. Trees grown from infected material usually grow well until they are 8 to 10 or even 16 to 18 years old, at which time scaling lesions develop on the trunk or main limbs; these are followed by general tree decline. As far as known, there is no insect vector of psorosis, and passage through seeds does not occur or is extremely rare. Man has been the inadvertent carrier of this destructive disease through use of budwood from diseased trees which had not yet developed the characteristic scaling lesions.

Tristeza is a killer of sweet orange growing on sour orange rootstock. It has killed over 20,000,000 trees in South America in 25 years and is still spreading. It appears to be traceable to the Orient, whence it was carried to South Africa, where it is now indigenous to the extent that sweet orange cannot be grown on sour orange rootstock. It has been carried to all the major citrus-growing areas of the world in symptomless host species, but in some the aphid vectors which spread it are either not present or are not efficient. The causal virus can infect sweet orange on any rootstock, but trees on such common rootstocks as sweet orange, Cleopatra mandarin, Rough lemon are not damaged.

Stubborn, originally described in California, was so named because affected trees did not respond to good treatment. Affected trees are stunted, thin in foliage, and fruits are sparse and misshapen. In some areas fruits on affected trees tend to be rough around the stem end and resemble an oak acorn.

Symptoms of stubborn are rather obscure, and therefore diagnosis is difficult. Surveys indicates that it may be more prevalent than realized, especially in western United States. Stubborn appears to be widely distributed in the Mediterranean area, where research workers report that it is spreading rapidly. Quantity and quality of fruit on stubborn-affected trees are reduced. These facts, along with its insidious nature, make stubborn a potentially serious disease.

Exocortis affects the trifoliate orange, **Poncirus trifoliata**, and some of the citrange hybrids which are used as rootstocks. When varieties carrying the exocortis virus are grown on these rootstocks, the rootstocks scale and became rough below the bud union, and the trees are generally dwarfed. Trifoliate orange and some of the citrange hybrids have shown up badly in some of the rootstock studies, whereas if an exocortis-free scion variety had been used for the top, the rootstock might have performed well.

Surveys by the Budwood Certification project of the Florida State Plant Board indicate that the exocortis virus is commonly present in grove trees. There is no evidence that exocortis spreads naturally in groves; the high incidence there is also the result of unwitting propagation from infected trees on rootstocks which do not show symptoms.

Xyloporosis, like exocortis, is apparently widespread in grove trees and, also like exocortis it is not expressed on the ordinary variety top-rootstock combinations. Symptoms are expressed on Orlando tangelo (the best test plant for determining the presence of the virus), on sweet lime, and on certain of the mandarins and mandarin hybrids.

On these varieties symptoms include gumming lesions in the bark, usually surrounded with orange-yellow tissue and accompanied by pits in the wood; when such symptom-expressing varieties are used as rootstocks, the tops are severly dwarfed and appear to suffer from nutrient deficiencies. Young affected nursery trees on such stocks grow well for 2 to 4 years before developing symptoms.

No discussion of virus diseases of citrus would be complete without mentioning the transmissible factor which reduces vigor in old-line clones and which is eliminated by passage through seeds to either gametic or nucellar seedlings. This factor, demonstrated to be transmissible, could be one of the known viruses such as stubborn, exocortis, or exloporosis or another yet undescribed virus. Although old-line affected trees may appear normal and bear no distinctive symptoms, they are strikingly reduced in vigor as compared with their nucllar offspring.

Vein enation and **limequat vein-banding** viruses are relatively unimportant but should be avoided in propagating stocks.

There is no evidence that any of the citrus viruses except tristeza spread naturally under grove conditions in Florida. It seems logical then that if groves were started with virus-free nursery stock they should remain free of all viruses except tristeza. In areas where the tristeza virus is spreading, rootstocks other than sour orange should be used. The Budwood Certification project of the Florida State Plant Board, which has been in operation for 5 years, now has stocks of many varieties free of tristeza and psorosis and some materials free of xyloporosis. It should soon have materials free of exocortis also and is to be commended for an excellent job.

W. C. PEDERSEN REPORTS . . . .

Most groves, with the exception of those that were most severely damaged by last winter's freezes, have a good crop of all varieties maturing in spite of the fact that this summer has been unusually dry. This is borne out by comparing the rainfall to date of this year with that of last year up to this time:

1957 — January through October — 64.14 inches.

1958 — January through October — 45.57 inches.

Less than this time last year — 18.57 inches.

This means that we are going into the dry season with very little reserve moisture. Already this fall it has been necessary to irrigate a few unusually dry groves.

As you can well imagine, this past summer has been a most busy one for production departments. Following the fifteen freezes of last winter, it was necessary to prune many groves. The amount of pruning necessary varied in direct relation to the amount of damage caused by last winter's freezes.

DISCOVERY OF NUTRITIVE VALUE OF TRACE ELEMENTS IN FLORIDA

(Continued from page 17)

Florida agriculture during the past three decades. Practically all visible symptoms of malnutrition have been corrected. It is possible that invisible symptoms still exist as hidden hunger, and with more refined methods and technique other elements will be found to have nutritive qualities.

Summary

The phenomenal plant response to copper in the Florida Everglades in 1925 and 1927 stimulated a broader approach to studying malnutrition problems in general, and lead to the discovery of the nutritive value of several trace elements. These discoveries brought relief to many malnutrition problems of animals and plants, thus clarifying unexplained observations of long standing. Florida has probably benefitted more than any state from their use. Vast tracts of marginal land have been transformed into productive lands through their rational use. The Florida Everglades is an outstanding example.

Taking all of the records into consideration, the unusual plant response of copper on the peat soils of the Florida Everglades in 1925 was the beginning of a broader approach to studying malnutrition problems of plants and animals, as well as man. The concept of nutrition has been given new life and greatly broadened since that date. It is doubtful that any decade in history has been any more helpful in clarifying nutrition problems than the decade following 1925. The significance of this new approach to malnutrition is impossible to properly evaluate. It was a milestone in history of nutrition.

References

1) Allison, R. V. et al. The Stimulation of Plant Responses on the Raw Peat Soils of the Florida Everglades through the use of Copper Sulphate and other chemicals. Fla. Ag. Exp. Sta. Bul. 190, 1927.

2) Barnette, R. M., and Camp, J. P. Experiments with Zinc Sulphate for the Correction of "White Bud" on Corn. Ag. News Letter, E. I. Dupont de Nemours Co., Vol. 3, Nov. 1935.

3) Becker et al, Salt Sick - Its Cause and Prevention. Fla. Agr. Exp. Sta. Bul. 231, 1931.

3-a) Becker et al, An. Report Fla. Agr. Exp. Sta. for 1937.

4) Bryan, O. C. The Stimulating Effects of External Applications of Copper and Manganese in certain Chlorotic Plants of the Florida Everglade Soils. Jour. Amer. Soc. Agron. 21:923-933, 1929.

5) Chandler, W. H. et al, Little Leaf or Rosette of Fruit Trees, II Effect of Zinc and Other Elements. Proc. Amer. Soc. Hort. Sci. 29, (1932) p. 255-263, 1933.

6) Fudge, R. B. The Effect of Copper on the Absorption of Nitgogen by Citrus in the Dieback Grove. Fla. Agr. Exp. Sta. Ann. Report p. 97, 1935.

7) Haas, A.R.C. Effect of Boron on the Growth of Citrus. California Citrograph, 14, 9:355, 1929.

8) Singleton, Gray, Factors Affecting the Maturity and Quality of Citrus Fruits. Proc. Fla. State Hort. Soc. 1929.

9) McHargue, J. S. The Significance of Copper, Manganese and Zinc in Forage and Food Plants. Jour. Amer. Soc. Agron. 17:367-372, 1925.

10) Mowry, H. Zinc Sulphate as a Corrective for Bronzing of Tung Trees. Fla. Agr. Exp. Sta. Ann. Report, p. 91, 1933.

11) Purvis, E. R., and Ruprecht, R. W. Crack Stem of Celery Caused by Boron Deficiency in the Soil. Fla. Agr. Exp. Sta. Bul. 307, 1937.

12) Reed, H. S., and Haas, A.R.C. Nutrient and Toxic Effects of Certain Ions on Citrus and Walnut Trees with Special Reference to the Concentration and pH of the Medium. California Agr. Exp. Sta. Tech. Paper 17, 1924.

13) Schreiner, O., and Dawson, P. R. Manganese Deficiency in Soils and Fertilizers. Eng. and Indus. Chem. 19:400-404, 1927.

14) Stewart I, and Leonard, O. D. Molybdenum Deficiency in Citru.s Proc. of Florida State Horticultural Soc. 1951.

R. C. ORR IS JOINING EDITORIAL STAFF OF EXPERIMENT STATION

Richard G. Orr, a 1957 graduate of the University of Florida, will become assistant editor with the University of Florida Agricultural Experiment Station November 1, according to Director J. R. Beckenbach.

He will succeed Chas. A. Stookey, who is resigning to become affiliated with the Alcoholic Rehabilitation Commission at Avon Park.

Orr graduated from the School of Journalism and Communications Jan. 28, 1957, and has been associated with Blue Cross-Blue Shield since then, with headquarters in Orlando. In his new post he will handle news releases for the Agricultural Experiment Station.

Report Of Sub-Committee To Fla. State Horticultural Society

This report presents findings and recommendations of a subcommittee appointed March 7, 1958 by R. S. Edsall, Chairman, Florida State Horticultural Society Citrus Budwood Certification Committee, the purpose of the subcommittee being to consider the establishment of a foundation-stock program under which virus-free clones of citrus varieties would be cared for, perpetuated, and equitably distributed to industry.

The need for such a program arises from several developments that were not anticipated when the Citrus Budwood Certification Program was originally designed. These developments are as follows:

1. Data accumulating from activities of the Budwood Program show an unexpectedly large percentage of candidate trees to be infected by viruses. In the case of xyloporosis alone, 72 percent of trees found to be otherwise acceptable, were disqualified due to this disease. Within certain varieties the situation is even more critical. It is doubtful whether there remain in the program more than one or two Valencia orange trees that are free of xyloporosis virus. Furthermore, the number of virus-free trees may well be reduced even more according to present indications that at least 40 percent of candidate trees in the Program will be eliminated due to exocortis. This unexpected turn of events, showing candidate trees to be more widely infected than originally supposed, raises the question whether qualifying trees should remain the property of entrants as originally outlined, or whether because of great cost and value to industry and state, some arrangement should be worked out for distribution scarce lines to industry as a whole.

2. Another development not foreseen at the inception of the Budwood Program was the authorization subsequently given the Plant Board in 1956 to test trees without the need of introducing them through participants. A number of desirable candidates have since been discovered and entered in the name of the State Plant Board. An equitable means is now needed to convey this material to interested nurserymen.

3. A third development is the recent inclusion in the Budwood Certification Program of nucellar seedlings selected by various research agencies and the State Plant Board. A Plan for the proper dissemination of this material is also needed.

4. A fourth development is the growing interest in nucellar strains and new varieties from outside the state. Present quarantine regulations prohibit the introduction of reproductive material other than seed. In the event these regulations are relaxed and budwood is allowed entry, introductions will have to be indexed for freedom from disease, and arrangements will have to be made for their equitable distribution to industry.

Programs in other states have been reviewed to discover how similar problems have been solved elsewhere. Foundation stock programs covering peach, potato, and cereal crops in New York, Illinois, Michigan, Washington, California, and Texas were examined. In general the problem of introduction has been solved in one of three ways:

1. By maintenance of lines through developing agencies and their direct distribution by them to nurserymen. This is the form usually taken by agricultural experiment stations, and the service is provided without charge.

2. By the development and distribution of limes by crop improvement associations that usually make a charge for material furnished, and

3. By the distribution of material through state regulatory agencies, who also assess charges.

It would seem that as far as Florida is concerned, greatest economy to both industry and state would result if a foundation-stock program were established and if this were to be administered by one of the organizations already concerned with plant sanitation — an organization, for instance, like the State Plant Board. Establishment of such a program might be facilitated by writing the following provisions into regulations now governing the Budwood Certification Program:

1. The Foundation Stock Program should provide for the pooling of clonal selections deemed worthy of preservation. Such a pool would be a repository for:

a. selections now in the Budwood Program, the available budwood which is in critically short supply,

b. selections introduced into the Budwood Program by the State Plant Board itself,

c. selections developed through breeding programs, and

d. selections introduced from outside the state,

2. Distribution of budwood from this planting would be to participants in the Budwood Certification Program. Details of several plans for accomplishing this are given in the Appendix (No. 1).

3. Amount of budwood to be made available would be limited to 350 eyes of each variety requested, or in the event of scarcity, to a lesser amount consonant with a policy of equitable distribution. The limitation of 350 eyes is based on an operation the scope of which is circumscribed by a moderate outlay for land, funds, and time.

4. Use of budwood by the recipient could be for commercial propagation or for the establishment of registered scion trees. In cases of the latter use, trees would have to be planted and registered in a scion grove in accordance with rules in the Budwood Certification Program's "Statement of Policy".

5. The Foundation Stock Program would not be considered to act as a limitation on the rights of experiment stations, other research agencies, and private plant breeders to introduce without prejudice, or to distribute without charge, such budwood as is under their respective jurisdictions—provided such budwood meets phytosanitary regulations for the movement of plants or plant parts.

To implement a Foundation Stock Program, it is anticipated that the following accommodations need be made available:

1. A suitable tract of land of not less than 25 acres, preferably isolated from other citrus plantings, adequately fenced, protected from cold, and provided with irrigation.

2. Replication of the collection in various parts of the State would be desirable, but in consideration

of greatly added costs, it is suggested that the plantings be held to one location, with research agencies encouraged to set out such rootstock and variety evaluation trials as appear pertinent.

3. A layout entailing:

a. the planting of not more than 5 trees per clone,

b. the inclusion of not more than 10 clones per variety, but usually 5 or less, with varieties being determined by a technical committee,

c. the budding of clones on the following rootstocks:

(1) trifoliate orange or one of its hybrids—as a continuing check on freedom from the virus of exocortis,

(2) sour orange—as a continuing check on freedom from the virus of tristeza,

(3) sweet lime—as a continuing check on freedom from the virus of xyloporosis,

(4) rough lemon—as a control that is tolerant to all three of the afore-mentioned viruses, and

(5) Cleopatra mandarin—as an added control that is tolerant to the above-mentioned viruses.

Trees in this planting would become the primary sources for clean budwood, and as such would allow for the elimination of the orginal parent tree.

5. Priority will be given to requests for buds from bona fide research agencies to the extent of 50 percent of the available supply.

By way of recapitulation, it is the thinking of this committee that recent developments not envisioned in the original "Statement of Policy" of the Citrus Budwood Certification Program, call for creation of a repository to accommodate the best budwood sources available—such a repository to be known as the Foundation Stock Program. It is also the committee's belief that such a program might with advantage be made a part of the present Budwood Certification Program and thus facilitate an efficient and equitable distribution of superior, disease-free budwood for the ultimate benefit of the whole industry.

In another connection, this committee was asked to determine future land requirements of the Citrus Budwood Certification Program. An estimate prepared by G. G. Norman, in charge of the Program, is attached as Appendix 2.

Appendix I

Several plans for facilitating the distribution of budwood from the Foundation Stock Program have been proposed. One would require that nurserymen interested in obtaining such budwood be asked to participate in the Budwood Certification Program with its attendant obligation of paying the regular $25.00 fee. While participation in the Budwood Program ordinarily involves the submission of candidate trees for indexing, this would not be necessary for those merely wishing to obtain budwood from the Foundation Stock Pool. Anyone having paid the $25 fee previously to enter the Budwood Program could obtain buds from the Foundation Stock Pool without further charge.

Another plan proposes that present participants in the Budwood Program be accorded the additional benefit of securing material from the pool in consideration for contributing to the pool any trees requested by the State Plant Board for its establishment.

Appendix II

MEMORANDUM TO: Paul E. Frierson

MEMORANDUM FROM: Gerald G. Norman

SUBJECT: Future Land Requirements of the Citrus Budwood Certification Program

1. Test Plot

At present the Certification Program has space and available test stocks for 370 additional trees. Approximately 100 sets of these trees are already allocated to parent candidates entered during the spring of 1958. These will be used this summer as the Tristeza indexing is completed. About 100 additional sets of test trees will be used in connection with the re-indexing of trees from heat chamber treatments. This will leave a balance of 170 available test sets for trees entered in the Program during 1959. By the spring of 1960 we should have additional land with test stocks established and available for inoculation.

By removal of the 1953 test trees on the nursery site at present and the 60 grapefruit trees at the south end of the nursery, the nursery site now in use could probably take care of our requirements through 1961. Since scion trees have become generally available, there has been a considerable reduction in the number of parent trees entered in the Program each year, but on the basis of the past five years' experience the test plot will require approximately one acre of land per year. Every available part of the current site will be in use by the spring of 1961. If a foundation planting can be established fairly soon, it would be logical to assume that the number of trees entered each year would be further reduced as this budwood became available to growers.

2. Foundation Planting

The Program probably has at present 200 trees or more that could be called "superior". In the foundation planting, these trees should ideally be replicated at least four times on several rootstocks to gain the greatest possible amount of information. Thus 20 or more trees might be considered necessary for each source of budwood. Assuming that 200 trees would be worthy of further study and appraisal, it would then be necessary to start the foundation planting with approximately 1000 trees. Selection, refinement and additional improvement of the best of these would probably result in the planting of 500 additional trees of second generation selections. Breeding programs under way would very probably contribute a good many additional trees of promise. It would seem, therefore, that in the foreseeable future 25 acres of land might be considered the minimum necessary for a foundation planting and that, in all likelihood, 40 acres would be better.

Eggs are easily and completely digested.

A Report On The Citrus Budwood Certification Program With Recommended Changes

R. S. EDSALL
12TH INDIAN RIVER SEMINAR
OCTOBER 1-2, 1958

The Citrus Budwood Certification program has now entered its sixth year of operation. What started out primarily to be a program for the control and elimination of psorosis has been expanded to include other virus diiseases such as tristeza, xyloporosis and exocortis. Data accumulated from activities of the Budwood Program show an unexpectedly large percentage of candidate trees to be infected by viruses.

In the case of xyloporosis alone, 72% of trees found to be otherwise acceptable, were disqualified due to this disease. Furthermore, the number of virus-free trees may well be reduced even more according to present indications that at least 40% of candidate trees in the program will be eliminated due to exocortis. In the case of certain varieties it has been extremely difficult to find candidate trees which are virus-free.

The economic loss to grove owners from psorosis infected trees has been apparent for many years and resulted in thousands of dollars expense and lost income. However, it has been only in recent years that we have realized there are many other virus diseases which are reducing the vitality and productiveness of our citrus trees. In addition to the direct loss from virus diseases the freezes of last winter demonstrated beyond a doubt that virus-infected trees are much more susceptable to cold injury.

The prospect of having virus-free trees which will be more vigorous, more productive, more cold resistant and longer lived has spurred on the workers in this Budwood Certification Program. Much progress has been made and we have, as of June 30, 1958, the following trees in the program:

Candidate parent trees	1,038
Seed source trees	143
Scion grove trees	16,405
Progeny of certified parents	262,742
State Plant Board acquisitions	296
	280,624

Registered nursery trees propagated to date:

Psorosis free	420,532
Psorosis & xyloporosis free	194,474

The ever increasing demand for disease-free trees has created many problems and necessitated changes in the program. The recent inclusion in the Budwood Certification Program of nucellar seedlings, selected by research gencies and the State Plant Board, requires a plan for the proper dissemination of this material.

Also the growing interest in nucellar strains and new varieties from outside the state presents a quarantine problem which will require a change in regulations and careful indexiing of all imported budwood for freedom from disease. Again, a plan is needed for the equitable distribution of these plant materials to industry.

Because of the very extended period necessary for exocortis indexing (6 to years) Dr. J. F. L. Childs of the USDA in Orlando has developed histological and microchemical laboratory techniques believed to be specific for the determination of the presence of exocortis in inoculations on trifoliata rootstocks. The length of time of inoculation necessary before satisfactory results can be obtained is not known at present, but is believed to be considerably shorter than the usual field test.

Further information on the length of time from inoculation to satisfactory tests will come from the program in the next few years as results of exocortis indexing, in considerable volume, can be correlated with results of the color test. In the meantime, preliminary indications of the presence of exocortis virus by means of the color test are of great value to the program.

The virus indexing work of the past few years has revealed a surprisingly high virus incidence in Florida citrus varieties. This condition makes it extremely important that some method of virus elimination be developed. To this end, Dr. T. E. Grant, Pathologist, USDA in Orlando, has developed a method of heat chamber treatment which at present indicates the possibility that certain virus diseases of citrus may be eliminated from young tissues, in living trees, by controlled heat over long periods of time.

Reindexing of material thus treated at present indicates this method has eliminated psorosis and tristeza from material known to be infected with these viruses. In order to determine the effectivenesses of this treatment with two other viruses, xyloporosis and exocortis, the certification program has now extended its work to include reindexing of infected material after heat chamber treatment.

In the five years of its operation, the program has shown that a large number of apparently healthy candidate trees are actually infected with one or more viruses. Because of this, budwood of some varieties that is entirely virus-free may be rare. In order to achieve the maximum amount of procurement and distribution of desirable budwood, a program of organized propogation and development by the State Plant Board is being considered.

This proposal was presented to,

(Continued on page 26)

The LYONIZER

COMPILED BY THE LYONS FERTILIZER COMPANY

Reports Of Our Field Men . . .

HIGHLANDS AND POLK COUNTIES

R. E. Lassiter, Jr.,
1168 Lakeshore Blvd.
Lake Wales, Fla.
Phone 3-3813

The middle of October finds growers in the area beginning to start their fall fertilizer application. Rain has been scarce and many growers have been irrigating for the past few weeks.

Some growers in the area have been applying another scalicide at this time. We have noticed quite a bit of fruit drop caused by scale around the stem end of the fruit.

The cooler weather has had beneficial effect in causing color break in the grapefruit.

There has been some movement of fruit in the area in the past two or three weeks.

PINELLAS, WEST PASCO, CITRUS & HERNANDO COUNTIES

Russell Fatic

Purple scale population is building up in quite a few of our groves. Some of the growers are using wettable powder parathion for its control. Others are trying a light oil in combination with malathion. It's still a little too early to judge the results of the spray.

Rust mites are again giving us a little trouble in this area. This is especially noticeable where 3 lbs. of Zineb per tank were used instead of the recommended 5 lbs.

Because of the lack of adequate rainfall, much of the fruit is running a little smaller in size than normal.

NORTH CENTRAL FLORIDA

V. E. Bourland
Winter Garden, Fla.
Phone 107

We are having beautiful, fall weather, but it is very dry. There are lots of small oranges and fruit as a whole is small, all feel this is the result of a dry summer, however, we had a late bloom. Most all cover crops have been chopped, and groves look exceptionally good, except where there was severe cold damage. Young trees have made a wonderful growth, but lots of them had to be watched continually. Several concerns have started picking some fruit, but it has been light, not too much passing test.

Most all packing houses, and other corporations are getting in shape to handle fruit when it passes the test. Most fruit in this section has been sold or tied up with crops. The growers have had a busy summer pruning, and keeping insects under control.

Truck farmers are busy getting in their seed beds, and setting some plants. Pastures have been very good through the summer, and cattle are looking good, but lots of cattlemen have had to supplement feeding with citrus syrup.

SOUTH HILLSBOROUGH, MANATEE AND SARASOTA COUNTIES

Eaves Allison
P. O. Box 365, Sarasota, Fla.
Phone Fulton 8-2611

Some grapefruit and some oranges are beginning to taste pretty good down this way at this writing — Oct. 14. It wont be long now before the long ladders and the picking crews will be making their early morning starts for the much-looked-forward-to harvest. There is optimism in the land!

Also activity is stirring in the tomato packing houses in the Palmetto - Ruskin area, and the time is pretty close when for the grower the money current turns and some will start rolling his way. That is always a welcome change.

Weather has been wet in spots — dry in others — some farms and groves are dusty and some are just drying out from many inches of rains. No disasterous effects either way — just good old "farmer's hazards."

Fall fertilizer applications have started on the groves in this area and it won't be much longer before the trucks will be rolling with the first loads for the early spring vegetable crops. Time do fly — even when you use that good Lyons fertilizer!

HILLSBOROUGH PASCO AND SUMTER COUNTIES

C. W. Dean
Gibsonton, Fla.
Phone Tampa 40-2592

We are having some dry weather at this time due to the hot weather and high winds we are having at this time. In some areas, irrigation is in progress.

Citrus crops vary. Some growers have a heavy crop, whereas some have no crop to speak of. The size of fruit vary according to the care that has been given them. Where the growers have applied the proper sprays, the size of their fruit is much larger than those that didn't get the spray. We have a large amount of fruit that have russetted very badly. From this and the dry weather the growers are having a great loss due to splitting. It seems that the russett and dry weather has hardened the peel so much that when we do have a shower of rain the inside of the fruit puts on its regular growth and the peel is so hard and tight that it can't expand with the inside, therefore causing the splitting. Where the growers have given their groves the proper sprays for rust mtes, which cause russett, we aren't having this splitting so badly.

SOUTH POLK, HIGHLANDS, HARDEE AND DeSOTO COUNTIES

C. R. Wingfield
Avon Park, Fla.
Phone Glendale 2-81881

Fruit has been moving with increasing volume each week. The sizes are possibly below normal due to dry weather conditions. Grapefruit and oranges are breaking color. Middle October has found many irrigating systems going into action and each day without rain will bring more need for them.

Cover crops are being worked into the soil and shortly we hope our groves will be clean. With the cover crop down and regular disking will help to hold moisture. Fertilizing has been under way with more for November. Careful study of the tree needs should be made because of the freeze damage the past winter. Scale and other insects are on a rampage and much spraying is being done.

The vegetable crops have begun to move and while acreage has been reduced in some sections we hope for higher prices with fairly good yields.

A REPORT OF THE CITRUS BUDWOOD CERTIFICATION PROGRAM

(Continued from page 23)

and is recommended by, the program's Technical Advisory committee and the Florida State Horticultural Society's committee for citrus budwood certification. Essentially, the plan calls for the establishment of a foundation planting, to consist of trees propagated from the best sources of budwood of commercial varieties now available. By pooling the best sources of all varieties, each grower could then obtain outstanding sources of budwood of varieties not otherwise available to him. The foregoing plan would have no bearing on foundation plantings already in process with individual cooperators, but would be used to supplement material available from these groves.

In May 1952 all Florida nurserymen were warned that when sufficient quantities of psorosis-free budwood became available, its use would be required. In spite of an extremely high virus incidence in Florida citrus varieties, the Florida Budwood Program has been able to develop, through its cooperators, over a quarter of a million psorosis-free trees (either parent, scion or progeny).

Consequently, it was considered that the time had come for the State Plant Board to issue an enforcing regulation regarding the propagation of psorosis-infected trees. Accordingly, all producers of citrus nursery stock were advised on December 9, 1957 that tentatively effective January 1, 1960 all citrus nursery stock showing psorosis leaf patterns would be quarantined. Since there is no recovery from this disease this quarantine would be equivalent to destruction.

The search for virus-free strains through Budwood Certification program is entirely voluntary on the part of the participating nurserymen and growers. However, the regulation restricting the movement of psorosis-infected nursery stock is compulsory.

Participants now in the Budwood program are estimated to produce 85% of all the nursery stock grown in the state. This regulation on psorosis is intended to make the production of psorosis-free nursery stock compulsory for the several hundred nurserymen in the state who are not producing such trees on a voluntary basis. So far as is known, this is the first time that compulsory propagation of psorosis-free citrus varieties has ever been attempted. It is the first step in what is hoped will lead to completely virus-free citrus groves in Florida's future.

Looking at this program from a practical standpoint, on several occasions I have had the opportunity to talk to nurserymen who are cooperators in this program. They all agree that they are getting an extra "bonus" from using virus-free budwood. When budding they get a much higher percentage of buds to live and the registered nursery trees grow much faster than "old line" trees. In addition to this, growers who have planted registered trees report that they have lost an unusually small number and that their trees have been growing exceptionally well.

I firmly believe that, as a result of our Budwood Certification program, the Florida citrus Industry can look forward to a new era of disease-free trees which will produce larger quantities of superior quality fruit.

STATE OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946, OF THE CITRUS INDUSTRY, PUBLISHED MONTHLY AT BARTOW, FLORIDA, FOR OCTOBER, 1958.

STATE OF FLORIDA,
COUNTY OF POLK.

Before me, a notary public in and for the State and County aforesaid, personally appeared S. Lloyd Frisbie, who having been duly sworn according to law, deposes and says that he is the Editor of The Citrus Industry and that the following is to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation) etc. of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March, 1922, embodied in Section 537, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher — Associated Publications Corp., Bartow, Fla.

Editor—S. Lloyd Frisbie, Bartow, Fla.

Business Manager — S. Lloyd Frisbie, Bartow, Florida.

2. That the owners are:

Associated Publications Corporation, Bartow, Florida.

S. Lloyd Frisbie, Bartow, Fla.
Loyal Frisbie, Bartow, Fla.
Richard R. Frisbie, Bartow, Fla.
B. L. Gable, New York, N. Y.
F. L. Skelly, Orlando, Fla.
B. W. Skinner, Dunedin, Fla.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4 That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holders appears upon the books of the company as trustee or in any other fiducary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold than that of a bona fide owner.

Sworn to and subscribed before me this 1st day of October, 1958.

S. LLOYD FRISBIE, Bus. Mgr.
MARY H. DUNSTON, Notary Public
My commission expires Nov. 1, 1960.

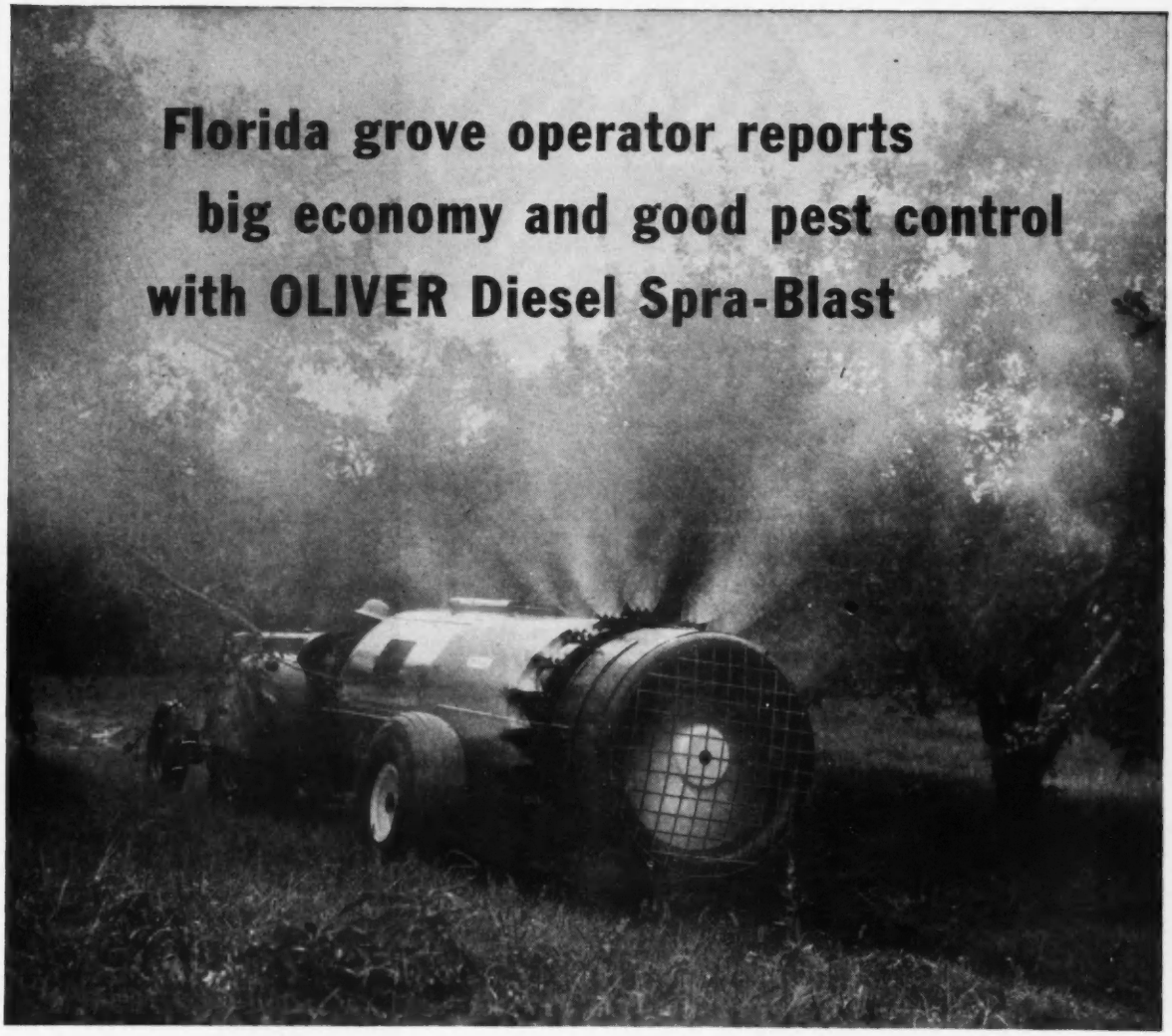
Zero Temperature Needed To Maintain Quality Of Frozen Concentrated Orange Juice . . .

The time frozen concentrated orange juice maintains its best quality when stored in the home refrigerator is shortened when the product is subjected to storage temperatures above zero, even though storage temperatures remain well below freezing.

This is the finding of Theo J. Kew and Vincent J. Senn, scientists at the U. S. Fruit and Vegetable Products Laboratory, Agricultural Research Service, USDA, Winter Haven, Fla., who conducted investigations to determine the effect of various temperatures on frozen orange concentrates during handling and storage from the time it leaves the processing plant until it reaches the consumer.

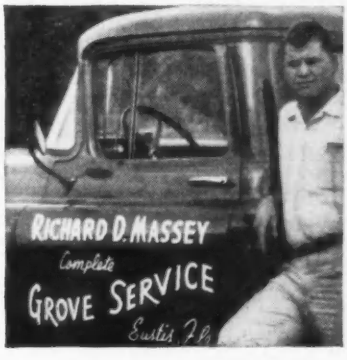
Classified Ads

Florida grove operator reports big economy and good pest control with OLIVER Diesel Spra-Blast



"I operate a complete grove management service. That's why I have to be sure of complete coverage and low costs. And I've found the ideal combination —the diesel-powered Model 500 Oliver Spra-Blast pulled by a diesel Super 77. Both units combined consume only 24 to 25 gallons of low-cost diesel fuel per day while putting on 45 tanks of material. The engine and fan are quieter and cost less to keep up, and at the same time give me excellent air penetration of all sizes of trees." Says:

Richard D. Massey
Eustis, Florida



This report is typical of the comments coming in from users of the Oliver Model 500 Spra-Blast. Where economy and complete coverage are important, orchard and grove operators are turning to Oliver.

Only Oliver offers diesel power at a cost comparable with most gasoline-powered sprayers. Gasoline models are also available—choose whichever saves you most. Both operate at 1850 rpm. for quiet, dependable service and low upkeep costs.

Oliver *extra advantages* at *no extra cost* include: 38-inch true airfoil design fan, choice of Marlow centrifugal or Iron Age piston-type pump, ultra-vision instrument panel, specially treated tank to resist corrosion, hydraulic hitch jack.

For *bigger profits* in 1959, arrange to try—arrange to buy a new Model 500 Oliver Spra-Blast. The Oliver Corporation, 400 West Madison Street, Chicago 6, Illinois.

OLIVER

"FINEST IN FARM MACHINERY"

Also Manufacturer of the Famous Oliver Outboard Motors

We Invite Comparison...

. . . . It has been the unvarying policy of this company from the first day of its existence to constantly seek to manufacture the finest fertilizers it is possible to produce . . . no expense has been spared to bring about the realization of this objective . . . and as a result only the very finest proven ingredients, and the most modern methods of manufacturing are always characteristic of our fertilizers.

. . . . We make this statement with no desire to belittle the products of other manufacturers, but simply to present the facts to those who grow Florida's fine citrus and vegetable crops. . . . . Many of the state's most successful growers have been using our fertilizers constantly throughout the years and have demonstrated for themselves the truth of our claims for producing fine fertilizers which result in their fine crops.

. . . . So we invite comparison, and suggest that if you are not already a user of Lyons fertilizers, that you set aside a plot, either large or small, in your grove or field and use our fertilizers exclusively in such a test plot . . . and let the results govern your future purchases.

. . . . When you figure the cost of your fertilizers, we recommend that you base any comparison upon the basis of your per box cost of fertilizers, rather than upon your total fertilizer expense.

You will also find our Field Service Men highly competent to advise with you on your production problems . . . and always willing to serve you.

Lyons Fertilizer Company

Phone 43-101

TAMPA FLORIDA